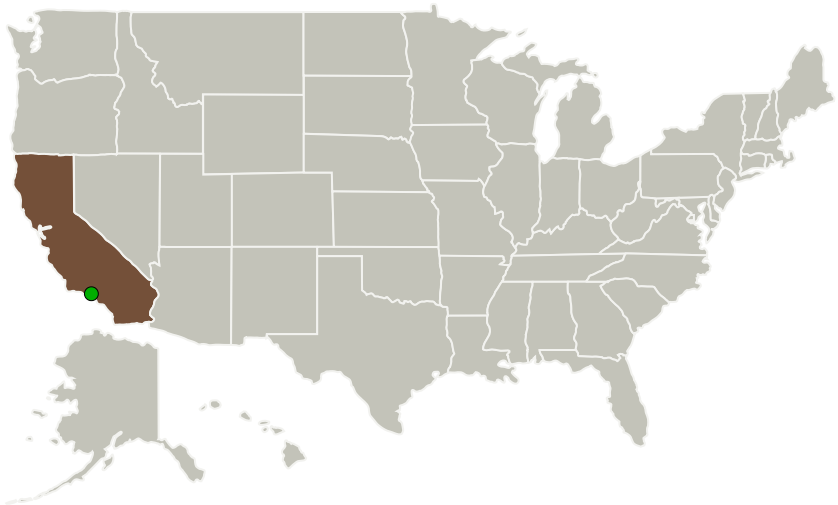
A Compact, Radiation Hardened, Stable, Low Power, Programmable Crystal Oscillator for Extreme Temperature and High Reliability Space Application, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

We propose a feasibility study of a fully intgrated radiation hardened (>1Mrad/si), programmable crystal oscilator (RPXO) in a miniature package that will deliver stable clock signal output under extreme temperature range from -230C to +200C. The innovations envisioned for RPXO will include a radiation hardened SiGe ASIC with HBT configuration for the analog section and CMOS configuration for the digital part. Recent research results of SiGe show excellent promise for a very wide operating temperature and high TID. Special design techniques will be studied and evaluated to reduce or eliminate SEL condition. Another innovation is an assembly that includes the crystal resonator and its mechanical support that will withstand the extreme temperature range as well as more than 2000 thermal cycles as experienced on Mars and Moon. Finite element analysis will be the main tool to establish confidence in the design study of the thermo-mechanical portions of the RPXO including package related mechanical interfaces. The microelecronic package will be commercially available and reflect a standard form-factor. It will hold all of the said elements and include provisions for programmability features of the RPXO. The package study will evaluate leadless version and compliant lead alternative configuration to facilitate the application of the device on PCB. All RPXO assembly process will be commercially viable and based on proven, and reliable techniques.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140051)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

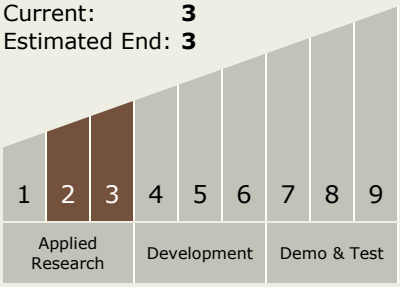
Kouros - Sariri

Co-Investigator:

Kouros Sariri

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.6 Radiation Hardened ASIC Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System